
Reference

RTS/ITS-00268

Keywords

ATS, CALM, ITS, management, testing, TTCN

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 3 of a multi-part deliverable covering Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102), as identified below:

Part 1: "Protocol Implementation Conformance Statement (PICS) specification";

Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";

Part 3: "Abstract Test Suite (ATS) and partial PIXIT proforma".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document provides the Abstract Test Suite (ATS) and partial PIXIT proforma for the protocols specified in ISO 24102-4 [1], ISO 24102-5 [2] based on the related TSS & TP specification TS 102 797-2 [4] and the PICS proforma TS 102 797-1 [3] and in accordance with the relevant guidance given in ISO/IEC 9646-1 [5], ISO/IEC 9646-2 [6], ETS 300 406 [7] and EG 202 798 [i.4].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ISO 24102-4:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications".
- [2] ISO 24102-5:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 5: Fast service advertisement protocol (FSAP)".
- [3] ETSI TS 102 797-1 (V1.2.1): "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 1: Protocol Implementation Conformance Statement (PICS) specification".
- [4] ETSI TS 102 797-2 (V1.2.1): "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 2: Test Suite Structure and Test Purposes (TSS & TP)".
- [5] ISO/IEC 9646-1:1994: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".
- [6] ISO/IEC 9646-2:1994: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".
- [7] ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [8] ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".
- [9] ETSI ES 201 873-7: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 7: Using ASN.1 with TTCN-3".
- [10] ETSI ES 202 784: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; TTCN-3 Language Extensions: Advanced Parameterization".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ISO 24102-3:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points".
- [i.2] ISO 21217:2014: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Communications architecture".
- [i.3] ISO 21218:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Medium service access point".
- [i.4] ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".
- [i.5] ETSI TR 103 099 (V1.1.1): "Intelligent Transport Systems (ITS); Architecture of conformance validation framework".
- [i.6] ISO 29281-1:2013: "Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 1: Fast networking & transport layer protocol (FNTP)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 24102-4 [1], ISO 24102-5 [2], TS 102 797-1 [3], TS 102 797-2 [4], ISO/IEC 9646-1 [5], ISO/IEC 9646-2 [6], ETS 300 406 [7], ES 201 873-1 [8], ES 201 873-7 [9], ES 202 784 [10], ISO 24102-3 [i.1], ISO 21217 [i.2], ISO 21218 [i.3] and EG 202 798 [i.4] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 24102-4 [1], ISO 24102-5 [2], TS 102 797-1 [3], TS 102 797-2 [4], ISO/IEC 9646-1 [5], ISO/IEC 9646-2 [6], ETS 300 406 [7], ES 201 873-1 [8], ES 201 873-7 [9], ES 202 784 [10], ISO 24102-3 [i.1], ISO 21217 [i.2], ISO 21218 [i.3] and EG 202 798 [i.4] apply.

4 Abstract protocol tester

In general, the conformance test system architecture as illustrated in the ITS testing framework EG 202 798 [i.4], see figure 1, applies. For the present document, the IUT is given by protocols located in the ITS-S management entity, thus several types of IUTs need to be considered. The "Upper tester application" allows accessing the "upper side" of the IUT. Lower layer protocols indicated by the block "ITS lower layers" allow access to the IUT from the "lower side". "Upper side" and "lower side" are obvious terms in case of protocols residing in an OSI communication layer. For management protocols, it will be clearly specified in clauses 5 and 6 what "upper side" and "lower side" mean.

The test system simulates valid and invalid protocol behaviour and analyses the reaction of the IUT.

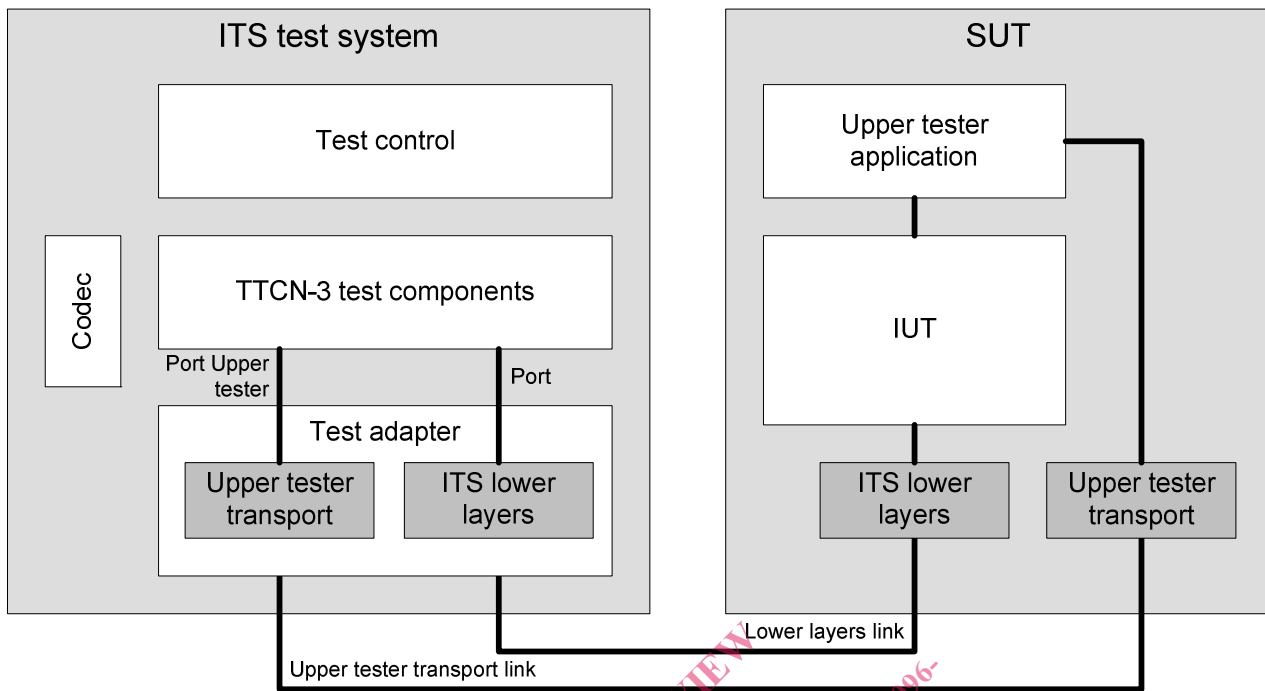


Figure 1: Abstract protocol tester - General approach

5 Abstract test method for FSAP

5.1 Abstract protocol tester

SUTs which support the "ITS station-Internal management Communications Protocol" (IICP) ISO 24102-4 [1] may benefit from the conformance test system architecture illustrated in figure 2, where the access to the IUT from top, i.e. in general via the upper tester application, is performed via management SAPs.

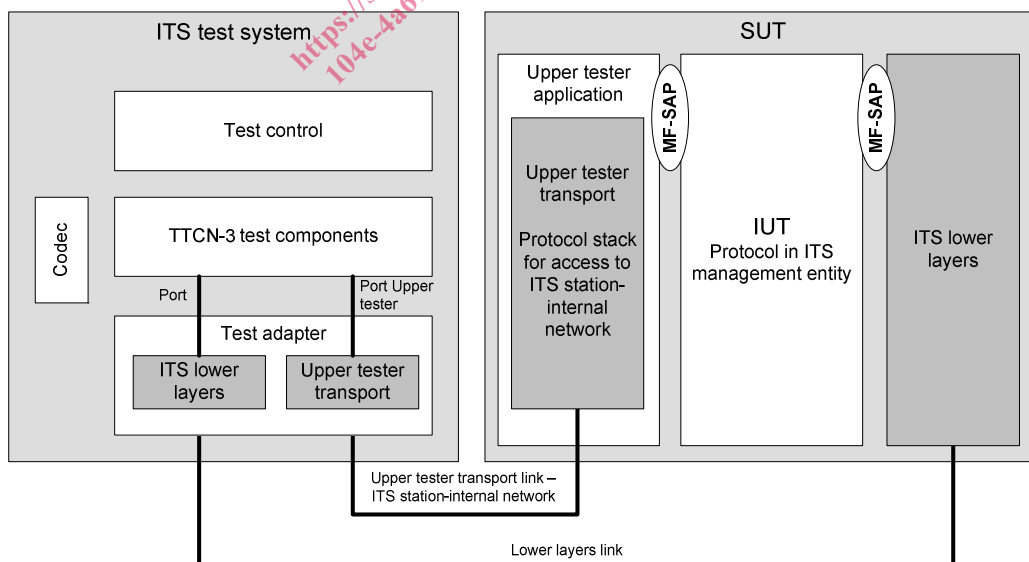


Figure 2: Abstract protocol tester for FSAP - IICP approach for upper tester

5.2 Test configurations

5.2.1 Roles of an ITS-SCU

The test suite for FSAP uses two test configurations in order to cover the different test scenarios. Distinction between the two configurations is given by the two possible implementation scenarios for an ITS station, i.e. a single-unit implementation, or an implementation with several "ITS station communication units" (ITS-SCU) which are interconnected via an ITS station-internal network ISO 24102-4 [1], ISO 24102-5 [2], ISO 21217 [i.2]. These ITS-SCUs can take over the roles of an ITS-S host, or an ITS-S router, or the combined role of ITS-S host and ITS-S router. The two identified testing configurations are referred to as CF01 for the single unit implementation, and CF02 for the multi-unit implementation and are described in clauses 5.2.2 and 5.2.3.

5.2.2 Test configuration CF01: No ITS station-internal network

In test configuration CF01 the roles of ITS-S host and ITS-S router are implemented in a single ITS-SCU as illustrated in figure 3. Consequently the whole supported functionality of FSAP is given in a single ITS-SCU and no station-internal forwarding between ITS-S host and ITS-S router is needed.

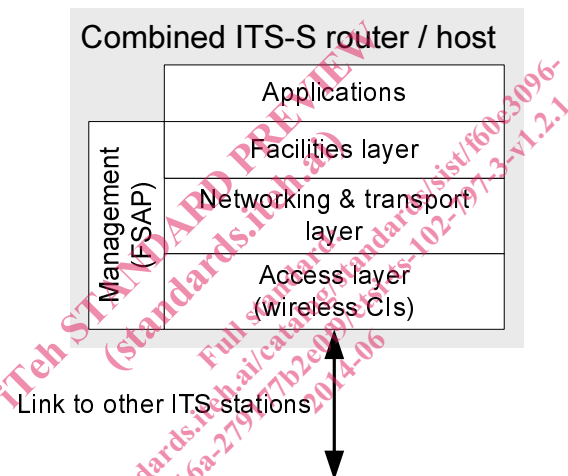


Figure 3: Test configuration CF01 architecture

This configuration is used in the cases listed below TS 102 797-2 [4]:

- ITS-S station internal-network PICS (PICS_S_INW) is set to false.
- The roles PICS (PICS_ROLE_RH) is set to true.

5.2.3 Test configuration CF02: ITS station-internal network

In test configuration CF02, the roles of ITS-S host and ITS-S router are implemented in different ITS-SCUs as illustrated in figure 4. Consequently there is communications needed between the ITS-SCU with host functionality and the ITS-SCU with router functionality. This communication goes via the ITS station-internal network using the "ITS station-Internal management Communications Protocol" (IICP) ISO 24102-4 [1].

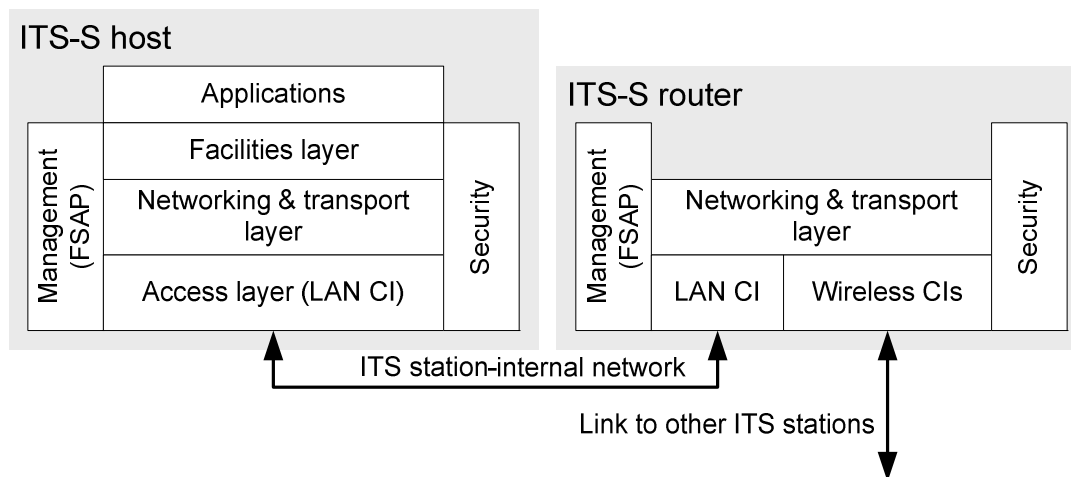


Figure 4: Test configuration CF02 architecture

This configuration is used in the cases listed below TS 102 797-2 [4]:

- ITS-S station internal-network PICS (PICS_S_INW) is set to true.

5.3 Test architecture

The present document implements the general TTCN-3 test architecture described in EG 202 798 [i.4], clauses 6.3.2 and 8.3.1.

Figure 5 shows the TTCN-3 test architecture used for the FSAP ATS.

- The MTC is of type ItsFSAP and communicates with the SUT over fsapPort in order to exchange FSAP messages (SAM, CTX) between the FSAP test component and the FASP IUT. The "ITS lower layers transport" system adapter is used to enable usage of ITS lower layers in the SUT in case the MF-SAP is not directly accessible.
- The MTC communicates with the SUT over the utPort in order to trigger FSAP functionalities by simulating primitives from e.g. application entities. It is required to trigger the FSAP layer in the SUT to send FSAP messages, which are resulting from upper layer primitives. Furthermore, receiving FSAP messages may result in notifications to other entities. The "Upper tester transport" system adapter is used to adapt to the upper tester application implementation of the SUT.
- The MTC communicates with the SUT over the cfPort in order to perform settings in the SUT. The "Configuration transport" system adapter is used to adapt to the configuration-access implementation of the SUT.

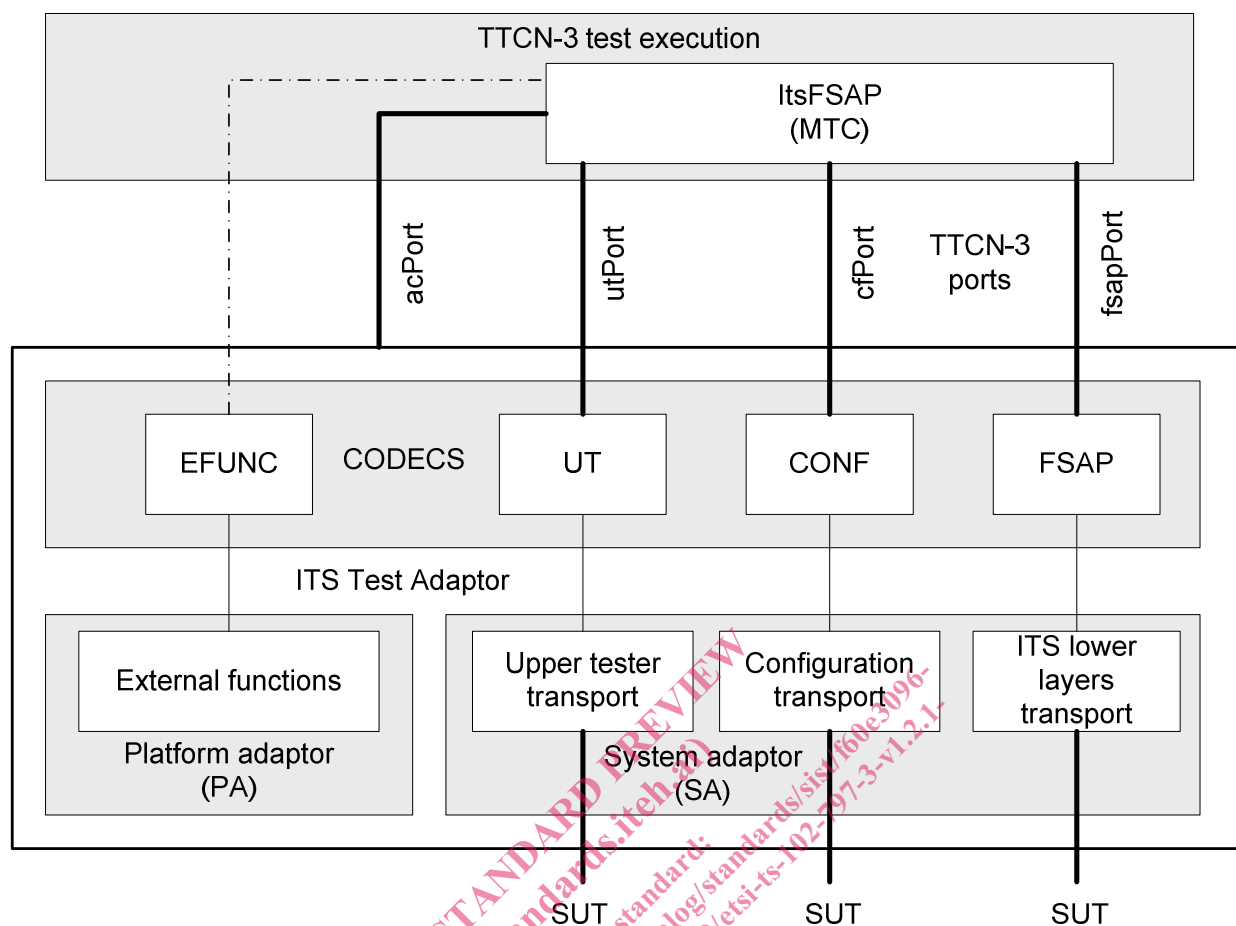


Figure 5: Test system architecture for FSAP

5.4 Ports and abstract service primitives

5.4.1 Overview

The following TTCN-3 ports are used by the FSAP ATS:

- **fsapPort** of type **FsapPort** is used to receive messages from and transmit messages to the IUT (via MF-SAP).
- **utPort** of type **UpperTesterPort** is used to receive service message from and transmit service messages to the IUT (via MF-SAP).

Every port provides "Abstract Service Primitives" (ASPs) as specified in clauses 5.4.2 and 5.4.3.

5.4.2 ASPs of the fsapPort

The following ASPs are used in the **fsapPort**:

- The **FsapReq** primitive used to send messages of type **NFsapPrimitivesUp** or **INsapPrimitivesUp** sent by the IUT.
- The **FsapInd** primitive used to receive messages of type **NFsapPrimitivesDown** or **INsapPrimitivesDown** from the IUT.